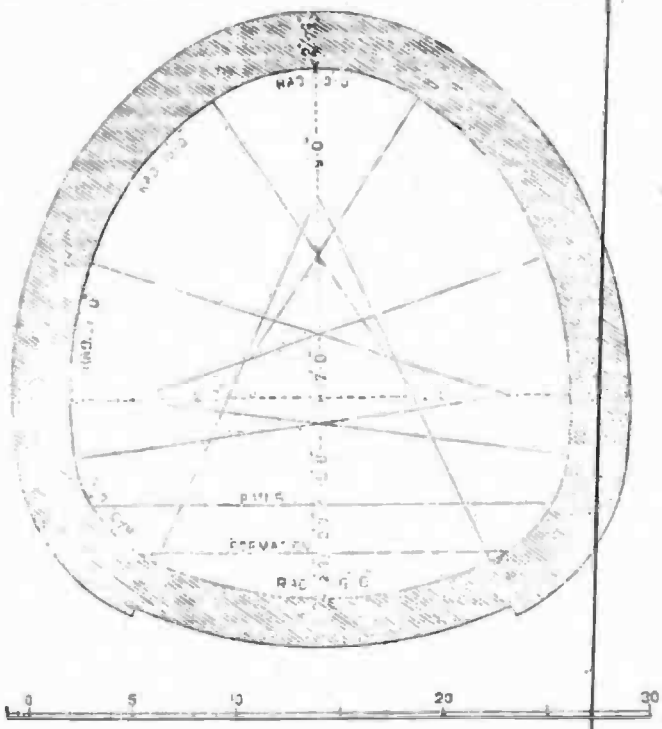
SECTION OF COPENHAGEN TUNNEL.



COPENHAGEN TUNNEL.

THE section of this tunnel will be useful to the student, as showing a series of curves throughout. The bricks are set as headers in the invert and sides; and in stretchers, or 4½ inch rings in the smaller curves. Great strength is thought to be obtained by this form, and skew backs are dispensed with. In no portion of the section do the bricks require cutting. The thickness of the brickwork is 2 ft. 7½ in., excepting the bottom, which is 2 ft. 3 in.

"Cement" is not used in this work, but mortar, made as here described:—

MORTAR.

Blue lias lime	5	parts.
Burnt clay or brick rubbish, ground	2	,,
Clean sharp sand	2	,,
Coke ashes	1	,,
	10	

Mixed by measure. The mortar is ground in a pan which revolves under two edge rollers, about 5 feet diameter, and one ton weight each. The pan is driven by steam power.

Messrs. W. and J. Cubitt are the engineers. The contractors are Messrs. Pearce and Smith.

Good mortar is of the utmost importance to the engineer, the architect, and the builder; and a knowledge of the ingredients necessary to compose such will be acceptable to all who wish to construct works of use and permanence. The Romans paid strict attention to the character of the mortar they used; in many instances the strength of their military walls depended entirely upon the strength of the mortar, as there was no bond in the arrangement of the stone. Such was the case in the great wall from Newcastle to Carlisle. Such in a great measure is the character of the masonry of the Liverpool Docks, as now, and for some time past, constructed by Mr. Jesse Hartley, the engineer. The cement called "Roman," was not known to the great builders of that building nation. In the vast dock works at Liverpool, it has not been used, and if good mortar is made and used with proper attention and care, cement of any other kind, as known by the name of "cement," will rarely be required. A mortar which sets gradually but surely, is in every respect to be preferred to a quick-setting and rigid cement. The young engineer or architect must not, however, sit down in idleness and draw up a specification from this, or any other recipe, but carefully analyze his materials, if new, and try by experiment, so as to make certain of adopting the best. There is a wide difference in the character and quantity of lime. The ingredients to combine, and mode of mixing, must be varied to suit each.

PROGRESS IN ARCHITECTURE.

ARCHITECTURE is both a science and an art. It may advance with rapidity in its first capacity, and yet remain stationary or even retrograde, and that without observation, in the second; and thus its health, nay, its life, as an art, may expire, till it sink into a mere craft of building, notwithstanding that the means at its command are far beyond those of any former age. Since the discoveries of the chemist and geologist have been added to its service, the extensive application of iron and the power of steam have increased its resources. And the enterprize of commerce and the present facilities of communication with other countries bring such materials within its reach, as formerly were unprocurable.

As an *art*, architecture is less imitative and more creative than either painting or sculpture; the materials with which it has to deal are too rugged and unyielding to allow of direct imitation; it thus becomes essentially conventional; it works rather with the principles than with the forms of nature; the type of ornament which it has thence chosen must be engrafted upon, and be developed together with, and not conceal, the idea of the stability of its framework; its means of expression also are more limited than those of its sister arts. *Material abstract beauty or sublimity* is its principal scope, and that a wide, noble, and sufficient one, for the limits of its power have not yet been reached by man, nor need it be feared that they will be. *Architecture*, then, in the first instance, may err and has erred from its character as an art, having been subordinated to that of science; for, connected as it is with several lucrative adjuncts, it is seldom embraced, like painting and sculpture, from an ardent love alone, but is coldly and calculatingly entered upon as a respectable profession and lucrative business, and therefore may, indeed, be kept in a respectable grade of dull mediocrity, but can never be raised to its proper position—at the summit of the arts, till it be undertaken with a nobler intention than to make it pay.

Architecture also may err and has erred inasmuch as association and prejudice have fettered it with the arbitrary laws of antiquarianism in its search after abstract beauty and sublimity. Such a catalogue of examples have been deduced from the works of the ancient masters, and fitted together, as a puzzle by a child, into a system that these masters themselves never dreamt of, to which it is attempted to bind us by an exact compliance, compelling a mere reproduction of their facts, and debarring us from venturing to the same source whence they drew, lest we might do aught for which we had not their authority, and thus would each work executed be the diminishing the range of invention, the rivetting another link to the chain, confining our liberty, instead of the adding of man's thought to thought,—the widening the sphere of our knowledge,—which knowledge is power, and given to us for further use, that having learnt how the great masters have applied those types chosen from the exhaustless stores of nature, we may likewise apply others for ourselves.

It now, however, appears to be generally acknowledged that we have a record of our own to leave, a transcript of the feelings of the age to embody in our works, and that, therefore, we *should strive* after more than a mere reproduction of those of past ages, and that we might effect more than has yet been done.

The question, then, by what means are we again to reach the true path of progress? is to us of the utmost practical importance, and is one that is occupying considerable attention. Nor has this question been raised without any attempts having been made to answer it; several suggestions have been offered for its solution.

It will be well, therefore, to take a brief review of the direction this movement has already taken, to endeavour to ascertain the position in which we are at present, to test the application of these suggestions to that position.

And, first, several voices have been raised in condemnation of our practice of following by turns Egyptian, Greek, Roman, or Goth, as fashion might sway, and warning us of the maze of error in which we were wandering without hope of freedom, bidding us to halt in our mad career, denouncing the false system of copyism, and, though, indeed, they pointed not out the right path, strove to lead us from the wrong one, — impugned the all-enslaving authority of antiquity, and put aside the distorting medium of association,—bid us to think for ourselves, and not to pilfer the thoughts of our fathers,—which first rent the veil of black darkness that overshadowed us, and rang the death-knell to the practice of a century. This, however, alone, would help us but little on our way, unsupported; it could only unsettle the mind for a time, till, disheartened by the knowledge of failure, we should relapse into a more hopeless state than before.

But further and next were we directed to the study of nature, and though to some this advice appeared, and even now appears, vague and unprecise, and from its want of precision was even rejected by others, it contains all the germs of truth; for as the children of nature, it reminded us of our mission as her disciples and expounders, for man has no other source of inspiration open to him, nor any other school wherein he can learn equal power or grace and refinement. This, then, was a beacon light held up, which flashed astonishment to those who trusted to the glimmerings of their own unaided inventions, that dreamt not of a brighter source than the reflected rays of a past and borrowed inspiration, and though in the panic of the moment this transferring of our allegiance from the tyranny of antiquarianism to the principles of nature, was stigmatized as presumption: truly there was more of presumption in the setting up of man and man's rules in her stead.

Nor is it to architecture alone that this salutary movement has been confined. There is in the other arts at the present day, an evident attempt after a *careful* and simple study of nature, the ground-work of all excellence.

Yet though this be a great step in advance, it is not sufficient for our purpose; for, as it has been observed, while *painting* and *sculp-*

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